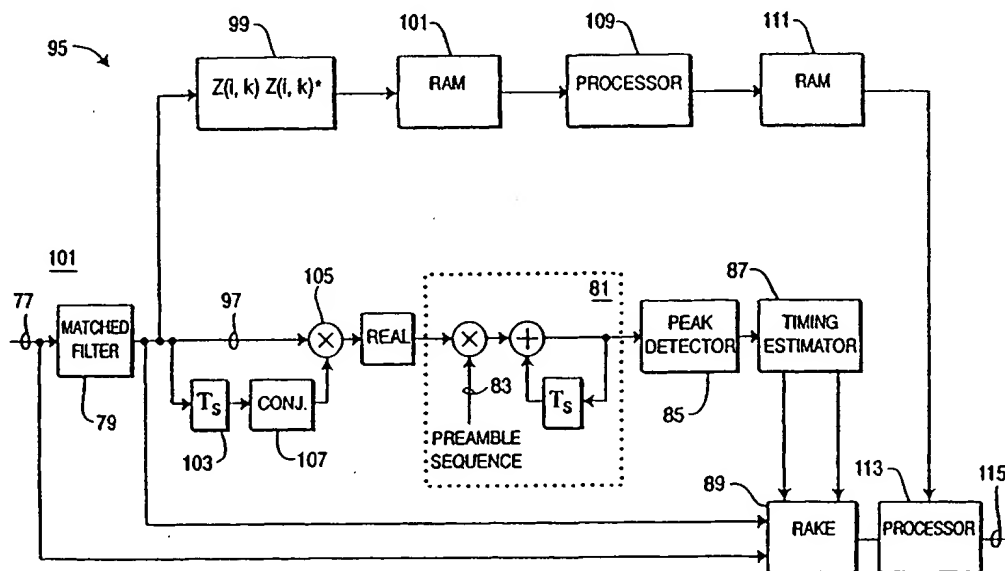




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷ : H04B 1/707		A2	(11) International Publication Number: WO 00/36761
			(43) International Publication Date: 22 June 2000 (22.06.00)
(21) International Application Number: PCT/US99/29504		(74) Agents: VOLPE, Anthony, S. et al.; Volpe and Koenig, P.C., Suite 400, One Penn Center, 1617 John F. Kennedy Boulevard, Philadelphia, PA 19103 (US).	
(22) International Filing Date: 14 December 1999 (14.12.99)			
(30) Priority Data: 60/112,299 14 December 1998 (14.12.98) US 60/116,284 19 January 1999 (19.01.99) US 60/125,418 22 March 1999 (22.03.99) US 60/129,177 14 April 1999 (14.04.99) US		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).	
(71) Applicant (for all designated States except US): INTERDIGITAL TECHNOLOGY CORPORATION [US/US]; Suite 527, 300 Delaware Avenue, Wilmington, DE 19801 (US).			
(72) Inventors; and			
(75) Inventors/Applicants (for US only): DICK, Stephen, G. [US/US]; 61 Bobann Drive, Nesconset, NY 11767 (US). DENNEAN, Charles [US/US]; 53 Vermont Street, Melville, NY 11747 (US). ZEIRA, Eldad [US/US]; 8 Old Oak Road, Trumbull, CT 06611 (US). PAN, Jung-Lin [-/US]; 31 Oneida Avenue, South Setauket, NY 11720 (US). SHIN, Sung-Hyuk [KR/US]; 1531 8th Street, Fort Lee, NJ 07024 (US). ZEIRA, Ariela [US/US]; 8 Old Oak Road, Trumbull, CT 06611 (US).		Published Without international search report and to be republished upon receipt of that report.	

(54) Title: RANDOM ACCESS CHANNEL PREAMBLE DETECTION



Abstract

The present invention relates to a detector that detects a transmitted digital signature using the energy output from a matched filter. Energies are tabulated according to an anticipated signature pattern for variable transmission distances. The tabulation accounts for round trip transmission delays and allows processing of the accumulated symbols to derive a correct signature whether coherent or non-coherent signature coding is used and multiple Doppler channels are present.

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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 1-2-130.1WO	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US99/29504	International filing date (day/month/year) 14/12/1999	Priority date (day/month/year) 14/12/1998
International Patent Classification (IPC) or national classification and IPC H04B1/707		
Applicant INTERDIGITAL TECHNOLOGY CORPORATION et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 8 sheets, including this cover sheet.

- ☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☒ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 14/07/2000	Date of completion of this report 22.03.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Ernst, C Telephone No. +49 89 2399 8958 

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/US99/29504

I. Basis of the report

1. This report has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments (Rules 70.16 and 70.17).):*

Description, pages:

1-29 as originally filed

Claims, No.:

1-16 as originally filed

Drawings, sheets:

1/13-13/13 filed with the demand

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/US99/29504

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

IV. Lack of unity of invention

1. In response to the invitation to restrict or pay additional fees the applicant has:

- ☐ restricted the claims.
☒ paid additional fees.
☐ paid additional fees under protest.
☐ neither restricted nor paid additional fees.

2. ☐ This Authority found that the requirement of unity of invention is not complied and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is

- ☐ complied with.
☒ not complied with for the following reasons:
see separate sheet

4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:

- ☒ all parts.
☐ the parts relating to claims Nos. .

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims 1 - 16
	No:	Claims
Inventive step (IS)	Yes:	Claims 1 - 16
	No:	Claims

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International application No. PCT/US99/29504

Industrial applicability (IA) Yes: Claims 1 - 16
 No: Claims

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

Section IV

The present application contains two groups of inventions.

The separate groups of invention are:

- a) claims 1 - 8 which disclose a method and a system for non-coherently coding a preamble signature in a CDMA system
- b) claims 9 - 16 which disclose a method and a system for detecting a code signature over a CDMA interface taking into account a range ambiguity in transmission.

The features defined in the two groups of claims have different technical effects and are related to different technical problems.

The particular technical features of the first group solve the problem of non-coherently encoding a preamble signature in a CDMA system by using a particular method of translating the coherent symbols into non-coherent symbols.

The particular features of the second group solve the problem of detecting a code (coherent or non-coherent) signature in a CDMA system in order to solve the range ambiguity in the transmission (see e.g. the problem described in the description page 9, the four last lines of the second paragraph: "It is known that range ambiguity will destroy the orthogonality ... an incorrect signature."). Further the passage "Summary of the invention" (page 10, first paragraph) shows only features (e.g. matched filters, energy tabulation, ...) related to the second group.

Thus, these two groups of inventions do not have any particular technical features in common, nor have any corresponding particular features as meant by Rule 13.2 PCT, as they relate to different solutions of different problems. Hence, Rule 13.1 PCT is not satisfied and the subject-matter of the application contains two subjects which are not linked by a single inventive concept.

Section V

First group of claims (claims 1 to 8)

Claim 1

Independent claim 1 discloses a method for non-coherently coding a preamble

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EXAMINATION REPORT - SEPARATE SHEET**

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signature. The claimed method discloses in particular that the preamble signature symbols A are multiplied by -1 if a first symbol of the preamble is negative and further said preamble signature symbols A is translated into a non-coherently coded signature (see features a) and b) of claim 1).

Since the prior art cited in the present search report does not disclose or suggest at least these steps, claim 1 satisfies the requirements of Articles 33(2) and 33(3) PCT.

Claim 2

Claim 2 discloses further steps of the method according to claim 1. Thus claim 2 satisfies the requirements of Articles 33(2) and 33(3) PCT in combination with claim 1.

Claim 3

Independent claim 3 discloses the method of translating the coherent symbols A into non-coherent symbols (see features b) and d) of claim 3). Thus analogous to the statement related to claim 1, claim 3 satisfies the requirements of Articles 33(2) and 33(3) PCT.

Claim 4

Claim 4 discloses further steps of the method according to claim 3. Thus claim 4 satisfies the requirements of Articles 33(2) and 33(3) PCT in combination with claim 3.

Claim 5

Claim 5 discloses an encoding system for non-coherently coding a preamble signature. Thus the statements regarding method claim 3 are applicable to the apparatus claim 5. Therefore claim 5 satisfies the requirements of Articles 33(2) and 33(3) PCT.

Claim 6

Dependent claim 6 discloses further features of the embodiment according to claim 5. Thus claim 6 satisfies the requirements of Articles 33(2) and 33(3) PCT in combination with claim 5.

Claim 7

Claim 7 discloses an encoding system for non-coherently coding a preamble signature. Thus the statements regarding method claim 1 are applicable to the apparatus claim 7. Therefore claim 7 satisfies the requirements of Articles 33(2) and 33(3) PCT.

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Claim 8

Dependent claim 8 discloses further features of the embodiment according to claim 7. Thus claim 8 satisfies the requirements of Articles 33(2) and 33(3) PCT in combination with claim 7.

Second group of claims (claims 9 to 16)

Claim 9

Claim 9 discloses a method for detecting a code signature over a CDMA interface taking into account a range ambiguity in transmission. In particular the method contains the step of including additional energies output from the matched filter with the energies derived from the received chips to account for range ambiguity.

Since the prior art cited in the present search report does not disclose or suggest at least this step, claim 9 satisfies the requirements of Articles 33(2) and 33(3) PCT.

Claims 10 and 11

These claims disclose further steps of the method according to claim 9. Thus claims 10 and 11 satisfy the requirements of Articles 33(2) and 33(3) PCT in combination with claim 9.

Claim 12

Independent claim 12 discloses a method for detecting a code signature over a CDMA interface taking into account a range ambiguity in transmission. In particular the method contains the step of storing a plurality of outputs from the matched filter, said plurality of outputs being greater than said plurality of symbols to anticipate the range ambiguity. Since the prior art cited in the present search report does not disclose or suggest at least this step, claim 12 satisfies the requirements of Articles 33(2) and 33(3) PCT.

Claims 13 and 14

These claims disclose further steps of the method according to claim 12. Thus claims 13 and 14 satisfy the requirements of Articles 33(2) and 33(3) PCT in combination with claim 12.

Claim 15

Claim 15 discloses a method for resolving range ambiguity in a received coded signature for detection in a CDMA air interface. In particular the method contains the

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step of including the power of additional symbols to account the range ambiguity. Since the prior art cited in the present search report does not disclose or suggest at least this step, claim 15 satisfies the requirements of Articles 33(2) and 33(3) PCT.

Claim 16

Claim 16 discloses a system for resolving range ambiguity in a received coded signature for detection in a CDMA air interface. Thus the statements regarding method claim 15 are applicable to the apparatus claim 16.

Therefore claim 16 satisfies the requirements of Articles 33(2) and 33(3) PCT.

Section VII

A document reflecting the prior art described on figures 1 and 2 (see the corresponding text related to "Description of the prior art"), is not identified in the description (Rule 5.1(a)(ii) PCT).

Section VIII

Claim 12

The description (see e.g. page 18, third paragraph) specifies that the value of the energy and not any undefined output as described in claim 12 is stored.

Therefore the subject matter of claim 12 lacks clarity (Article 6 PCT).

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 99/29504

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04B1/707 H04J13/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04J H04L H04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 378 417 A (AGILIS CORP) 18 July 1990 (1990-07-18) column 6, line 1 - column 7, line 5 ---	1-8
A	GERANIOTIS E A ET AL: "Performance of noncoherent direct-sequence spread-spectrum communications over specular multipath fading channels" IEEE TRANSACTIONS ON COMMUNICATIONS, MARCH 1986, USA, vol. COM-34, no. 3, pages 219-226, XP002140478 ISSN: 0090-6778 abstract page 687, left-hand column, line 1 - right-hand column, line 2 page 688, left-hand column, line 1 - line 41 --- -/--	1-8

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"8" document member of the same patent family

Date of the actual completion of the international search

29 September 2000

Date of mailing of the international search report

12 10 2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Larcinese, A

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 99/29504

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 696 762 A (OHLSON JOHN ET AL) 9 December 1997 (1997-12-09) column 1, line 57 - line 63 column 2, line 18 - line 49 column 4, line 30 -column 5, line 49 -----	9-16
A	WO 98 49859 A (QUALCOMM INC) 5 November 1998 (1998-11-05) page 2, line 11 -page 3, line 5 page 6, line 6 - line 36 -----	9-16

INTERNATIONAL SEARCH REPORT

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Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-8

Method and system for non-coherently coding a preamble signature in a CDMA system.

2. Claims: 9-16

Method and system for detecting a coded signature over a CDMA interface taking into account range ambiguity in transmission

INTERNATIONAL SEARCH REPORT

Information on patent family members

Int. Application No

PCT/US 99/29504

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0378417 A	18-07-1990	US 4930140 A CA 2007554 A JP 2290344 A	29-05-1990 13-07-1990 30-11-1990
US 5696762 A	09-12-1997	AU 713533 B AU 2533097 A CA 2248647 A EP 0883936 A WO 9736383 A	02-12-1999 17-10-1997 02-10-1997 16-12-1998 02-10-1997
WO 9849859 A	05-11-1998	AU 7161198 A	24-11-1998